

## SUBGENUS *MESORTHACLADIUS* (DIPTERA, CHIRONOMIDAE) FROM CHINA

KONG Fan-Qing, LIU Wei, WANG Xin-Hua\*

College of Life Science, Nankai University, Tianjin 300071, China

**Abstract** *Orthocladius* (*Mesorthocladius*) from China is reviewed. One new species, *O. (M.) tornatilis* sp. nov., and one new record species, *O. (M.) vaillanti* Longton & Cranston, 1991, are described and illustrated as adult males. A key to the male imagines of the subgenus *Mesorthocladius* is presented.

**Key words** Diptera, Chironomidae, *Orthocladius*, *Mesorthocladius*, new species, China.

### 1 Introduction

The genus *Orthocladius* van der Wulp, 1874 is a common, speciose and widespread genus, and over 100 species have been described (Cranston *et al.*, 1989) in the Holarctic Region. The subgenus *Mesorthocladius* was erected by Sæther (2005). To date, six species have been recorded worldwide, of which four are Holarctic, one is Palearctic and two are Nearctic (Caldwell, 1998; Langton & Cranston, 1991; Makarchenko & Makarchenko, 2011; Sæther, 2005; Soponis, 1990; Wang, 2000; Yamamoto, 2004).

According to Sæther (2005), the male imagines of the subgenus *Mesorthocladius* are separable from those of other subgenera by a combination of characters: collar-like superior volsella, inferior volsella with ventral part not extended below dorsal part, anal point robust with rounded apex or broadly triangular, eyes extended dorsomedially, male-like or when female-like scutellars multiserial, anteprenotals numerous (9–27) and crista dorsalis prominent, scutellars usually multiserial, when uniserial to biserial eyes not female-like and anal point broadly triangular or anal lobe strongly projecting and sensilla chaetica present on both mid and hind leg, anal lobe of wing usually strongly projecting.

Wang (2000) recorded *O. (M.) frigidus* (Zetterstedt, 1838) from China, while it was included in *Orthocladius* s. str. Below one new species and two additional species of *O. (Mesorthocladius)* are recorded.

### 2 Methods and Material

The morphological nomenclature follows Sæther (1980). The material examined was mounted on slides following the procedure outlined by Sæther (1969). Measurements are given as ranges followed

by the arithmetic mean. In the figures of the male genitalia the dorsal aspect is shown to the left, the ventral aspect and apodemes to the right. All types are deposited in the College of Life Sciences, Nankai University, China (BDN).

### 3 Species Description

#### 3.1 *Orthocladius (Mesorthocladius) frigidus* (Zetterstedt)

*Chironomus frigidus* Zetterstedt, 1838: 811.

*Orthocladius (Euorthocladius) frigidus* (Zetterstedt), Brundin, 1947: 21; 1956: 101.

*Orthocladius (Orthocladius) frigidus* (Zetterstedt), Soponis, 1987: 123; Oliver *et al.*, 1990: 32; Wang, 2000: 637.

*Orthocladius (Mesorthocladius) frigidus* (Zetterstedt), Sæther, 2005: 26; Makarchenko & Makarchenko, 2011: 117.

**Material examined.** 10 ♂♂, Sichuan Province, Ganzi Autonomous County, Yajiang River, 14 Nov. 1996, light trap, WANG Xin-Hua; 1 ♂, Gansu Province, Mt. Qilian, 24 June 1993, sweep net, WANG Xin-Hua; 2 ♂♂, Hebei Province, Mt. Wuling, 21 June 1995, light trap, BU Wen-Jun.

**Diagnostic.** The species can be separated from other members of the subgenus by having scutellars multiserial, superior volsella collar-like, inferior volsella long and narrow, and anal point parallel-sided with a rounded tip.

**Remarks.** Soponis (1987) gave a detailed description of this species. Soponis (1977) did not include *O. frigidus* (Zetterstedt) in any of the subgenera, whereas Brundin (1956) included the species in *Euorthocladius*. Soponis (1987) later transferred *O. frigidus* to *Orthocladius* s. str., primarily based on the pupa. Sæther *et al.* (2000), however, transferred the species back to *Euorthocladius* primarily based on the similarity with *O. rousellae* Soponis. Diagnoses and descriptions of all stages of

\* Corresponding author.

This research was supported by National Natural Science Foundation of China (NSFC) grant Nos. 30770249, 30870329, J0630963 and Fauna of China (FY120100) are thankfully acknowledged.

Received 8 Dec. 2011, accepted 8 Mar. 2012.

*O. (Euorthocladius)* in the limited sense were given by Sopenis (1990). The exclusion of *O. frigidus* from *Euorthocladius* by Sopenis (1987) was based only on the fact that the pupae possess normally developed anal macrosetae. Other characters and stages are more similar to those of *O. (M.) rousellae* which apparently is the sister species of *O. (M.) frigidus*.

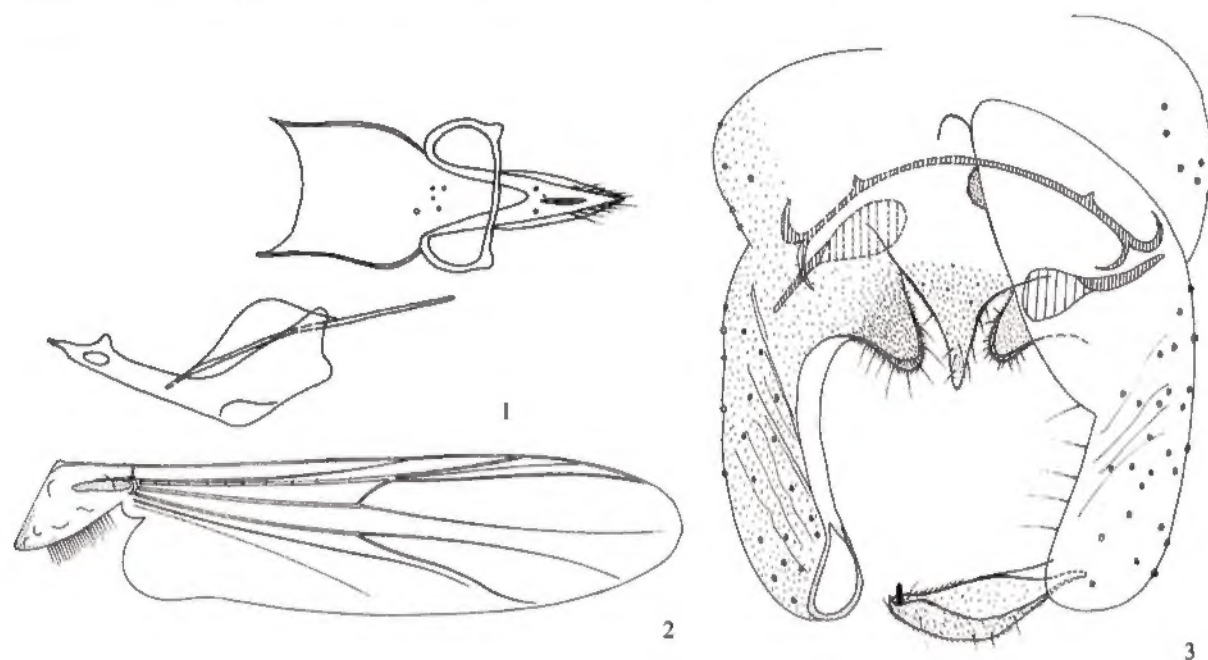
Distribution. The species has been recorded from

the Holarctic Region, and it occurs in both Palaearctic and Oriental China.

### 3.2 *Orthocladius (Mesorthocladius) tornatilis*

sp. nov. (Figs 1–3)

Holotype ♂, China, Jilin Province, Changbaishan Natural Reserve Area, 30 Apr. 1994, sweep net, WANG Jun-Cai.



Figs 1–3. *Orthocladius (Mesorthocladius) tornatilis* sp. nov. 1. Tentorium, stipes and cibarial pump. 2. Wing. 3. Hypopygium.

Diagnosis. The species can be separated from other members of the subgenus by having inferior volsella with rounded dorsal part, gonostylus widest medially, and crista dorsalis long and low.

Male ( $n = 1$ ). Total length 3.43 mm. Wing length 2.58 mm. Total length / wing length 1.33. Wing length / length of profemur 2.48.

Coloration. Dark brown.

Head. AR 1.72. Ultimate flagellomere 810  $\mu\text{m}$  long. Temporal setae 15, including 1 inner vertical, 6 outer verticals and 8 postorbitals. Clypeus with 11 setae. Cibarial pump, tentorium and stipes as in Fig. 1. Tentorium 176  $\mu\text{m}$  long, 44  $\mu\text{m}$  wide. Stipes 198  $\mu\text{m}$  long, 68  $\mu\text{m}$  wide. Palpomere lengths (in  $\mu\text{m}$ ): 35, 57, 123, 101, 145. Length ratio of palpomeres 5/3 1.18.

Wing (Fig. 2). Anal lobe well developed. VR 1.03. Costal extension 20  $\mu\text{m}$  long. R with 10 setae, other veins bare. Squamma with 24 setae.

Thorax. Anteprenotum with 10 setae. Dorsocentrals 17, acrostichals 7, prealars 5. Scutellars 48, multiserial.

Legs. Spur of fore tibia 66  $\mu\text{m}$ , spurs of mid tibia 29  $\mu\text{m}$  and 25  $\mu\text{m}$  long, of hind tibia 74  $\mu\text{m}$  and 28  $\mu\text{m}$

long. Comb of 12 setae, shortest seta 33  $\mu\text{m}$ , longest seta 62  $\mu\text{m}$ . Width at apex of fore tibia 55  $\mu\text{m}$ , of mid tibia 38  $\mu\text{m}$ , of hind tibia 59  $\mu\text{m}$ . Pseudospurs present on  $ta_1$  and  $ta_2$  of mid and hind leg, 21–27  $\mu\text{m}$  long. Sensilla chaeticae absent. Lengths (in  $\mu\text{m}$ ) and proportions of legs in Table 1.

Table 1. Lengths (in  $\mu\text{m}$ ) and proportions of legs segments of male *O. (M.) tornatilis* sp. nov.

	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>
fe	1 040	1 100	1 210
ti	1 230	1 120	1 400
ta <sub>1</sub>	900	540	800
ta <sub>2</sub>	540	350	475
ta <sub>3</sub>	390	280	360
ta <sub>4</sub>	255	180	220
ta <sub>5</sub>	160	150	165
LR	0.73	0.48	0.57
BV	2.36	2.88	2.80
SV	2.52	4.11	3.26
BR	2.50	3.13	2.30

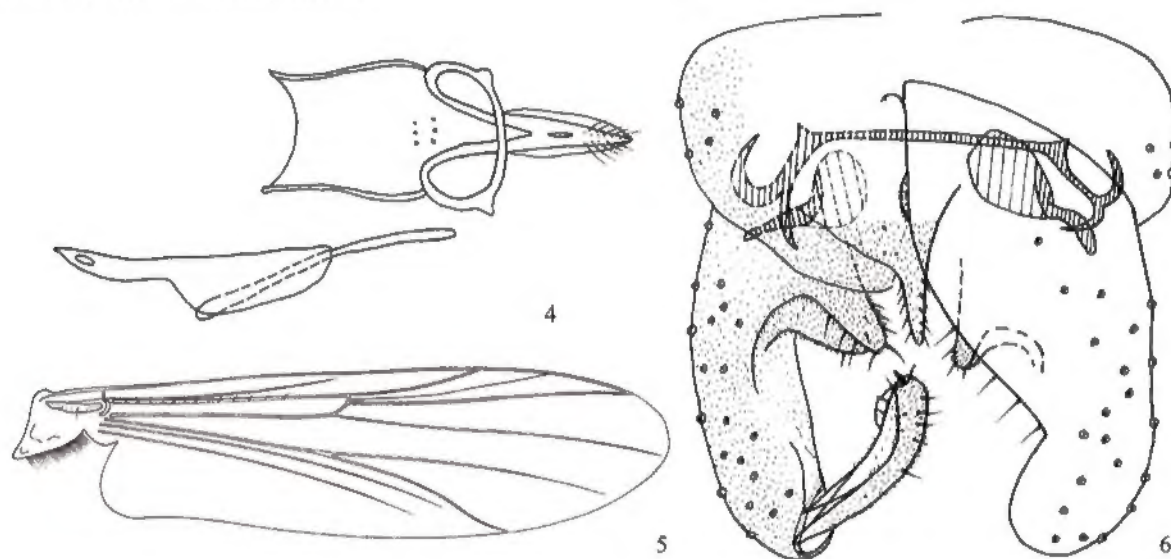
Hypopygium (Fig. 3). Tergite IX including anal point with 14 setae. Laterosternite IX with 10 setae.

Anal point 53  $\mu\text{m}$  long, 18  $\mu\text{m}$  wide. Phallapodeme 50  $\mu\text{m}$  long; transverse sternapodeme 113  $\mu\text{m}$  long, oral projections well developed. Gonocoxite 288  $\mu\text{m}$  long, inferior volsella with dorsal part rounded apically, covering ventral part. Gonostylus widest medially, 120  $\mu\text{m}$  long; crista dorsalis long and low; megasta 12  $\mu\text{m}$  long. HR 2.40, HV 2.85.

Distribution. The species was collected in Jilin Province in Palearctic China.

### 3.3 *Orthocladus* (*Mesorthocladus*) *vallanti* Longton & Cranston (Figs 4–6)

*Orthocladus* (*Orthocladus*) *vallanti* Longton & Cranston, 1991: 251; Caldwell *et al.*, 1997: 8; Caldwell, 1998: 235.



Figs 4–6. *Orthocladus* (*Mesorthocladus*) *vallanti* Longton & Cranston. 4. Tentorium, stipes and cibarial pump. 5. Wing. 6. Hypopygium.

Head. AR 1.40. Ultimate flagellomere 700  $\mu\text{m}$  long. Temporal setae 16, including 3 inner verticals, 2 outer verticals and 11 postorbitals. Clypeus with 14 setae. Cibarial pump, tentorium and stipes as in Fig. 4. Tentorium 167  $\mu\text{m}$  long, 53  $\mu\text{m}$  wide. Stipes 220  $\mu\text{m}$  long, 73  $\mu\text{m}$  wide. Palpomere lengths (in  $\mu\text{m}$ ): 53, 57, 150, 141, 216. Length ratio of palpomeres 5/3 1.44.

Wing (Fig. 5). Anal lobe well developed. VR 1.02. Costal extension absent. R with 13 setae, other veins bare. Squamma with 34 setae.

Thorax. Anteprenotum with 13 setae. Dorsocentrals 11, acrostichals 15, prealars 6. Scutellars 35, multiserial.

Legs. Spur of fore tibia 70  $\mu\text{m}$ , spurs of mid tibia 37  $\mu\text{m}$  and 29  $\mu\text{m}$  long, of hind tibia 77  $\mu\text{m}$  and 25  $\mu\text{m}$  long. Comb of 11 setae, shortest seta 27  $\mu\text{m}$ , longest seta 48  $\mu\text{m}$ . Width at apex of fore tibia 59  $\mu\text{m}$ , of mid tibia 55  $\mu\text{m}$ , of hind tibia 73  $\mu\text{m}$ . Pseudospurs present on  $ta_1$  and  $ta_2$  of mid and hind leg, 22–28  $\mu\text{m}$  long. Sensilla chaeticae absent. Lengths (in  $\mu\text{m}$ ) and proportions of legs in Table 2.

*Orthocladus* (*Mesorthocladus*) *vallanti* Longton & Cranston, 2005: 26; Makarchenko & Makarchenko, 2011: 117.

Material examined. 1 ♂, Sichuan Province, Litang County, Shiliang River, 13 June 1996, light trap, WANG Xin-Hua.

Diagnosis. The species can be separated from other members of the subgenus by costal extension absent, crista dorsalis apically, and inferior volsella with dorsal part long and tapering.

Male ( $n = 1$ ). Total length 4.73 mm. Wing length 2.95 mm. Total length / wing length 1.60. Wing length / length of profemur 2.89.

Coloration. Brown.

Hypopygium (Fig. 6). Tergite IX including anal point with 15 setae. Laterosternite IX with 7 setae.

Table 2. Lengths (in  $\mu\text{m}$ ) and proportions of legs segments of male *O. (M.) vallanti* Longton & Cranston.

	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>
fe	1 020	1 100	1 250
ti	1 275	1 150	1 400
ta <sub>1</sub>	875	575	825
ta <sub>2</sub>	585	390	460
ta <sub>3</sub>	400	300	360
ta <sub>4</sub>	250	190	220
ta <sub>5</sub>	170	150	175
LR	0.69	0.50	0.59
BV	2.26	2.74	2.83
SV	2.52	3.91	3.26
BR	1.65	2.14	2.55

Anal point 55  $\mu\text{m}$  long, 19  $\mu\text{m}$  wide. Phallapodeme 60  $\mu\text{m}$  long; transverse sternapodeme 125  $\mu\text{m}$  long, oral projections well developed. Gonocoxite 295  $\mu\text{m}$  long, inferior volsella with dorsal part long and



tapering. Gonostylus 128  $\mu\text{m}$  long; crista dorsalis apically, rounded; megasta 14  $\mu\text{m}$  long. HR 2.30, HV 3.69.

**Remarks.** The species was primarily included in the subgenus *Orthocladus* s. str. (Langton & Cranston, 1991; Caldwell *et al.*, 1997; Caldwell, 1998), and it was transferred to the subgenus *Mesorthocladus* by Sæther (2005).

**Distribution.** The species was recorded in the Holarctic Region, and it occurs in Sichuan Province in Oriental China.

#### Key to male imagines of *Orthocladus* subgenus *Mesorthocladus*.

1. Virga well developed ..... *O. (M.) lamellatus* Sæther  
Virga weak or absent ..... 2
2. Anal point with pointed apex ..... *O. (M.) nimidens* Sæther  
Anal point with rounded apex ..... 3
3. Gonostylus widest medially, and crista dorsalis long and low .....  
..... *O. (M.) tornatilis* sp. nov.  
Gonostylus not widest medially, and crista dorsalis not long and low ..... 4
4. Costal extended beyond end of  $R_{4+5}$  ..... 5  
Costa not extended beyond end of  $R_{4+5}$  .....  
..... *O. (M.) vaillanti* Langton & Cranston
5. Gonostylus slightly curved in dorsal part, inferior volsella large and rounded ..... *O. (M.) kishkhoae* Makarchenko & Makarchenko  
Gonostylus not curved in dorsal part, inferior volsella not large and rounded ..... 6
6. Inferior volsella with dorsal part long and narrow, anal point distinct broad ..... *O. (M.) frigidus* (Zetterstedt)  
Inferior volsella with dorsal part not long and narrow, anal point not so broad ..... *O. (M.) roussellae* Sponis

**Acknowledgements** We are grateful to Mr. JI Bing-Chun and Mrs. LI Yu-Fen who made the slide preparations.

#### REFERENCES

- Brundin, L. 1947. Zur Kenntnis der schwedischen Chironomiden. *Arkiv för Zoologi*, 39A (3): 1–95.
- Brundin, L. 1956. Zur Systematik der Orthoclaadiinae (Dipt., Chironomidae). *Report Institute Freshwater Research Drottningholm*, 37: 5–185.
- Caldwell, B. A. 1998. Description of the adult male and larva of *Orthocladus* (*Orthocladus*) *vaillanti* (Diptera: Chironomidae). *Journal of the Kansas Entomological Society*, 71: 234–240.
- Caldwell, B. A., Hudson, P. L., Lenat, D. R. and Smith, D. R. 1997. A revised annotated checklist of the Chironomidae (Insecta: Diptera) of the Southeastern United States. *Transactions of the American Entomological Society*, 123: 1–53.
- Cranston, P. S., Oliver, D. R. and Sæther, O. A. 1989. The Adult Males of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic Region. Keys and Diagnoses. In: Wiederholm, T. (ed.), *Chironomidae of the Holarctic Region. Keys and Diagnoses. Part 3. Adult Males*. *Entomologica Scandinavica*, 34 (Suppl.): 165–352.
- Langton, P. H. and Cranston, P. S. 1991. Pupae in nomenclature and identification: West Palearctic *Orthocladus* s. str. (Diptera: Chironomidae) revised. *Systematic Entomology*, 16: 239–252.
- Makarchenko, E. A. and Makarchenko, M. A. 2011. Fauna and Distribution of the Orthoclaadiinae of the Russian Far East. In: Wang, X and Liu, W (eds.), *Proceedings of the 17<sup>th</sup> International Symposium on Chironomidae*. pp. 107–125.
- Oliver, D. R., Dillon, M. E. and Cranston, P. S. 1990. A Catalog of Nearctic Diptera. Research Branch Agriculture Canada Publication. 1857/B, 89 pp.
- Sæther, O. A. 1969. Some Nearctic Podonominae, Diamesinae, and Orthoclaadiinae (Diptera: Chironomidae). *Bulletin of the Fisheries Research Board of Canada*, 170: 1–154.
- Sæther, O. A. 1980. Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica Scandinavica*, 14 (Suppl.): 51.
- Sæther, O. A. 2005. A new subgenus and new species of *Orthocladus* van der Wulp, with a phylogenetic evaluation of the validity of the subgenera of the genus (Diptera: Chironomidae). *Zootaxa*, 974: 1–56.
- Sæther, O. A., Ashe, P. and Murray, D. E. 2000. Family Chironomidae. In: Papp, L. and Darvas, B. (eds.), *Contributions to a Manual of Palearctic Diptera (with Special Reference to the Flies of Economic Importance)*. Vol. 4. Appendix A. 6, Science Herald, Budapest. pp. 113–334.
- Sponis, A. R. 1990. A revision of the Nearctic species of the *Orthocladus* (*Euorthocladus*) (Diptera: Chironomidae). *Spixiana*, 13 (Suppl.): 1–56.
- Sponis, A. R. 1977. A revision of the Nearctic species of *Orthocladus* (*Orthocladus*) van der Wulp (Diptera: Chironomidae). *Memoirs of the Entomological Society of Canada*, 102: 1–187.
- Sponis, A. R. 1987. Notes on *Orthocladus* (*Orthocladus*) *frigidus* (Zetterstedt) with a redescription of the species (Diptera: Chironomidae). *Entomologica Scandinavica*, 29 (Suppl.): 123–131.
- Wang, X. 2000. A Revised Checklist of Chironomidae from China (Diptera). In: Hoffrichter, O. (ed.), *Late 20th Century Research on Chironomidae. An Anthology from the 13th International Symposium on Chironomidae*. Shaker Verlag, Aachen. pp. 629–652.
- Wulp, F. M. van der. 1874. Dipterologische aantekeningen. *Tijdschrift voor Entomologie*, 17: 109–148.
- Yamamoto, M. 2004. A catalog of Japanese Orthoclaadiinae (Diptera: Chironomidae). *Makunagi, Acta Dipterologica*, 21: 1–121.
- Zetterstedt, J. W. 1838. *Dipterologis Scandinaviae*. Sect. 3. Diptera. 477–868.

#### 中国直突摇蚊属中直突摇蚊亚属记述 (双翅目, 摇蚊科)

孔凡青 刘 巍 王新华\*

南开大学生命科学学院 天津 300071

**摘 要** 记述中国直突摇蚊属中直突摇蚊亚属 *Orthocladus* (*Mesorthocladus*) 雄成虫 3 种, 并对 1 新种 *O. (M.) tornatilis* sp. nov. 和中国 1 新纪录种 *O. (M.) vaillanti* Langton & Cranston 做详细描述。模式标本保存于南开大学生命科学学院摇蚊学研究室。

**圆钝中直突摇蚊, 新种 *O. (M.) tornatilis* sp. nov.** (图 1 ~

**关键词** 摇蚊科, 直突摇蚊属, 直突摇蚊属, 中直突摇蚊亚属, 新种, 中国。  
**中图分类号** Q969.442.6

\* 通讯作者。

3)

雄成虫与本亚属其它已知种的区别如下: 下附器背叶末端圆钝, 抱器端节中部最宽, 亚端背脊长而低。

正模 ♂, 吉林省长白山岳桦林, 1994-04-30, 扫网, 王俊才采。

词源: 新种种名源自其下附器背叶圆钝。